

Letter

RIFLE is not RIFLE: on the comparability of results

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In the consensus RIFLE criteria [1] of acute kidney injury (AKI) the thresholds given for serum creatinine (sCr) increase and glomerular filtration rate (GFR) decrease (Table 1) do not correspond [2]. Direct measurement of GFR in clinical practice is difficult, and values are more often estimated (eGFR) by the Cockcroft-Gault equation or the Modification of Diet in Renal Disease (MDRD) formula. In addition, there is controversy in the literature whether eGFR provides more clinical information regarding AKI than changes in sCr [3].

As an example of the possible discrepancy, a 1.5-fold increase (50%) in sCr from a baseline of 1.0 mg/dL in a 60-year-old white male corresponds to only a 37% eGFR decrease using the MDRD formula. In this scenario the patient is classified in RIFLE class R by both methods. In the same patient an only 30% increase in sCr (1.0 mg/dL to 1.3 mg/dL), however, corresponds to a 26% decrease of eGFR. Therefore, the patient would consequently be classified as having AKI in RIFLE class R by the GFR threshold but not based on sCr changes. This theoretical disagreement in defining and staging AKI by RIFLE has been outlined previously [2], but data to estimate potential discrepancy in a 'real world' scenario are not available.

Table 1**RIFLE criteria for the definition of acute kidney injury (urinary output criteria not listed)**

| RIFLE class | RIFLE criteria |
|-------------|---|
| R (risk) | ≥1.5-fold increase in serum creatinine, or >25% decrease in GFR |
| I (injury) | ≥2-fold increase in serum creatinine, or >50% decrease in GFR |
| F (failure) | ≥3-fold increase in serum creatinine, or >75% decrease in GFR |

Furthermore, the use of different versions of RIFLE criteria counteracts the original goal of a consensus definition and hinders comparability.

To understand the differences better, we applied these two methods of calculating RIFLE to consecutive patients undergoing cardiac surgery with cardiopulmonary bypass between 2005 and 2007 at our institution. AKI was defined by using

Table 2**RIFLE classes by creatinine and estimated glomerular filtration rate thresholds**

| RIFLE stage by eGFR thresholds | RIFLE stage by creatinine thresholds | | | | Total |
|--------------------------------|--------------------------------------|------------|------------|-----------|---------------|
| | No-AKI | Class R | Class I | Class F | |
| No-AKI | 3,921 (81.1%) | 0 | 0 | 0 | 3,921 (81.1%) |
| Class R | 463 (9.6%) | 252 (5.2%) | 0 | 4 (0.1%) | 719 (14.9%) |
| Class I | 0 | 58 (1.2%) | 111 (2.3%) | 12 (0.2%) | 181 (3.7%) |
| Class F | 0 | 0 | 0 | 15 (0.3%) | 15 (0.3%) |
| Total | 4,384 (90.7%) | 310 (6.4%) | 111 (2.3%) | 31 (0.6%) | 4,836 (100%) |

eGFR, estimated glomerular filtration rate; GFR, glomerular filtration rate.

AKI = acute kidney injury; AKIN = Acute Kidney Injury Network; eGFR = estimated GFR; GFR = glomerular filtration rate; MDRD = Modification of Diet in Renal Disease; sCr = serum creatinine.

either largest sCr increase or eGFR decrease (MDRD formula) within the first postoperative week compared to baseline. In all patients a preoperative baseline sCr was available. We did not use urine output criteria to define AKI.

Among the total cohort, 9.3% patients were diagnosed as having AKI by the sCr criteria versus 18.9% with eGFR criteria (Table 2). The largest disagreement was detected in class R. Overall, the diagnosis of AKI using eGFR thresholds was more sensitive than sCr changes, and this was also true for staging of patients in RIFLE classes R and I. However, for patients staged in the highest AKI class F, sensitivity was higher for sCr criteria. These discrepancies can be expected to be found in other patient populations when non-uniform methods of determining RIFLE criteria are utilized. Our findings may assist in interpretation of other clinical studies.

Recently the RIFLE criteria have been modified by the Acute Kidney Injury Network (AKIN) [4], and the change in eGFR is no longer included in this consensus definition set. RIFLE criteria calculated by both methods remain widely used and the process of comparison between the two definition schemes (RIFLE and AKIN) in various patient populations is not yet complete. Further validation is required and modifications in the definition and staging of AKI can be expected [5].

Competing interests

The authors declare that they have no competing interests.

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